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# Innovativeness and Export Orientation Among Establishments in Knowledge-Intensive Business Services (KIBS), 2003

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r revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
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# Innovativeness and Export Orientation Among Establishments in Knowledge-Intensive Business Services (KIBS), 2003

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**Note of appreciation**

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses and governments. Accurate and timely statistical information could not be produced without their continued cooperation and goodwill.

# The science and innovation information program

The purpose of this program is to develop **useful indicators of science and technology activity** in Canada based on a framework that ties them together into a coherent picture. To achieve the purpose, statistical indicators are being developed in five key entities:

- **Actors**: are persons and institutions engaged in S&T activities. Measures include distinguishing R&D performers, identifying universities that license their technologies, and determining the field of study of graduates.
- **Activities**: include the creation, transmission or use of S&T knowledge including research and development, innovation, and use of technologies.
- **Linkages**: are the means by which S&T knowledge is transferred among actors. Measures include the flow of graduates to industries, the licensing of a university's technology to a company, co-authorship of scientific papers, the source of ideas for innovation in industry.
- **Outcomes**: are the medium-term consequences of activities. An outcome of an innovation in a firm may be more highly skilled jobs. An outcome of a firm adopting a new technology may be a greater market share for that firm.
- **Impacts**: are the longer-term consequences of activities, linkages and outcomes. Wireless telephony is the result of many activities, linkages and outcomes. It has wide-ranging economic and social impacts such as increased connectedness.

The development of these indicators and their further elaboration is being done at Statistics Canada, in collaboration with other government departments and agencies, and a network of contractors.

Prior to the start of this work, the ongoing measurements of S&T activities were limited to the investment of money and human resources in research and development (R&D). For governments, there were also measures of related scientific activity (RSA) such as surveys and routine testing. These measures presented a limited picture of science and technology in Canada. More measures were needed to improve the picture.

Innovation makes firms competitive and we are continuing with our efforts to understand the characteristics of innovative and non-innovative firms, especially in the service sector that dominates the Canadian Economy. The capacity to innovate resides in people and measures are being developed of the characteristics of people in those industries that lead science and technology activity. In these same industries, measures are being made of the creation and the loss of jobs as part of understanding the impact of technological change.

The federal government is a principal player in science and technology in which it invests over five billion dollars each year. In the past, it has been possible to say only *how much* the federal government spends and *where* it spends it. Our report **Federal Scientific Activities, 1998 (Cat. No. 88-204)** first published socio-economic objectives indicators to show *what* the S&T money is spent on. As well as offering a basis for a public debate on the priorities of government spending, all of this information has been used to provide a context for performance reports of individual departments and agencies.

As of April 1999, the Program has been established as a part of Statistics Canada's Science, Innovation and Electronic Information Division.

The final version of the framework that guides the future elaboration of indicators was published in December, 1998 **(Science and Technology Activities and Impacts: A Framework for a Statistical Information System**, Cat. No. 88-522). The framework has given rise to **A Five-Year Strategic Plan for the Development of an Information System for Science and Technology** (Cat. No. 88-523).

It is now possible to report on the Canadian system on science and technology and show the role of the federal government in that system.

Our working papers and research papers are available at no cost on the Statistics Canada Internet site at http://www.statcan.ca/cgi-bin/downpub/research.cgi?subject=193.

# Table of contents

**The science and innovation information program** ..... **4**

**Acknowledgements** ..... **6**

**Abstract** ..... **6**

Innovativeness and exports ..... 7
The service sector's emerging importance in innovation and exports ..... 7
KIBS and Canada's exports of services ..... 9

**Methodology** ..... **11**

Descriptive results ..... 12
Innovative establishments are more likely to be exporters ..... 12
Does knowledge intensity matter? ..... 13

**Regression analysis** ..... **14**

Logit regression models ..... 14
Regression 1 ..... 14
Multinomial Logit regression – all KIBS ..... 14
Regression 2 ..... 15
Multinomial Logit regression - only new technology KIBS ..... 15
Regression 3 ..... 15
Multinomial Logit - separate regressions for establishments of different sizes ..... 15
Regression 4 ..... 15
Multinomial Logit - separate regressions for product innovators and non-innovators ..... 15
Results of regression analysis ..... 16

**Conclusions** ..... **20**

**References** ..... **21**

**Catalogued publications** ..... **23**

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## Abstract

In this article, the link between establishment innovativeness and export orientation is examined among KIBS (knowledge-intensive business services) operating within Canada. Controlling for foreign or domestic control, size of establishment, training level of workforce, usage of intellectual property protection and industry type, it finds that innovation is positively linked to export orientation. It also finds that different factors are important for explaining export orientation for innovators than for non-innovators as well as for establishments of different sizes.

# Introduction

## Innovativeness and exports

A large body of literature links innovation to exporting. The linkages of innovativeness to firms' success also have a strong foundation in economic thought. Product-cycle models of world trade (Krugman, 1979) hold that on the global level, industrialized countries have to continually maintain their innovative edge in order not to lose competitiveness. "Northern" countries' absolute level of welfare depends on the rents obtained from innovating and keeping ahead in the creation of new products, while the production of old products tends to move elsewhere, through technology transfer, in Krugman's example this being the global "South". In this framework, the continual development and exporting of innovative products is central to economic welfare in a country like Canada.

In a context of an ever wider opening of national economies to trade across the world, many recent studies have linked innovative activity to exporting. Increased global competition is thought to lead to increased importance of exporting, and exporting to be linked to offering new and innovative products (product innovation) or increased productivity (process innovation). This framework appears sound and well supported by an abundance of studies on manufacturers from Europe (Lachenmaier, 2004; Wakelin, 1998), Asia (Aw and Hwang, 1995) and Latin America (Alvarez and Robertson, 2001; Roberts *et al*, 1997, Braga and Willmore, 1991, Crespi, 1999), as well as North America. Discussions now abound on mediating factors, such as the role of foreign direct investment (FDI) and the role of intellectual property in innovation and export performance (Alvarez, 2001). The differences in productivity and wages between innovators and non-innovators and their mediating role in establishments entering export markets are the objects of other studies (Bleaney and Wakelin, 2002). Still others study the channels by which exporters are able to specialize, increase their productivity and/or learn by exporting as well as allocate more resources to research and development (R&D) (Baldwin and Gu, 2004; Clerides et al, 1998), something which could be called a "Stages" approach to understanding exporting.

## The service sector's emerging importance in innovation and exports

However, while studies abound on the linkage of innovation to exports in manufacturing industries, Canada's economy has been moving away from a manufacturing base. By 2003, the service sector accounted for 68% of GDP and 75% of employment, having also made large inroads in terms of R&D spending (Rosa and Gault, 2004), which was traditionally seen as an activity of the manufacturing sector. Canada, like other western societies, is characterized by a service-based economy paradigm. The service sector is now expected to become a central focus of study in understanding economic growth.

In 2005, the most dynamic and innovative enterprises in Canada may in fact be in the Service sector, particularly in the "Professional, scientific and technical services" category. Establishments in these industries increased their share of Canada's GDP from 3% in 1994 to 4.5% in 2003, with increases in employment of 66% compared to 21% in the total service sector during this period (Lonmo, 2005). They also outpaced all other service industries in terms of R&D performed, growing from 12.4% of industrial R&D in 1997, to 19.5% by 2003. Lastly, they are notable by their ability to attract highly valuable labour, as the average wages in all 12 industries comprised in this category were superior to wages for the economy as a whole, while wages in the service sector were slightly below the Canada average (Lonmo, 2005).

Establishments in Professional, scientific and technical services professional industries have previously been characterized as knowledge intensive business services (KIBS) and are becoming the focus of increasing attention; as they are characterized by a high "knowledge" component (in terms of highly educated labour force and R&D expenditures), they are believed to play a major role in technology transfer and knowledge creation and have a large impact on the economies of countries (Miles et al, 1995).

The role of KIBS in economic growth is believed to be more important than just their share of GDP or R&D spending, due to the crucial role of learning and knowledge creation that these establishments are able to perform. The new knowledge arising from interactions with clients is believed to be part of a larger cycle of generation and diffusion (or usage) of newly created or transmitted knowledge, and the application of this knowledge in production, particularly among their clients in the manufacturing sector (Tomlinson, 2000). This factor is valuable not only in terms of functional (technological) knowledge, but also due to learning from and adapting to clients' needs, which has been labelled interactive learning (Hauknes, 2000).

Manufacturers' practice of contracting-out important knowledge-based tasks to KIBS may indicate an important accumulation of technological capabilities among the KIBS (Miles et al, 1995). In a European context, the innovativeness of KIBS has been linked to the level of interaction with other establishments (Muller and Zenker, 2001). For this reason, studying export orientation among Canadian KIBS is a valuable first step towards understanding how knowledge creation and diffusion originating in Canadian KIBS' operation in foreign markets contributes to Canada's economic growth, through a process which could be called knowledge circulation in a global knowledge diffusion system (Howells and Roberts, 2000).

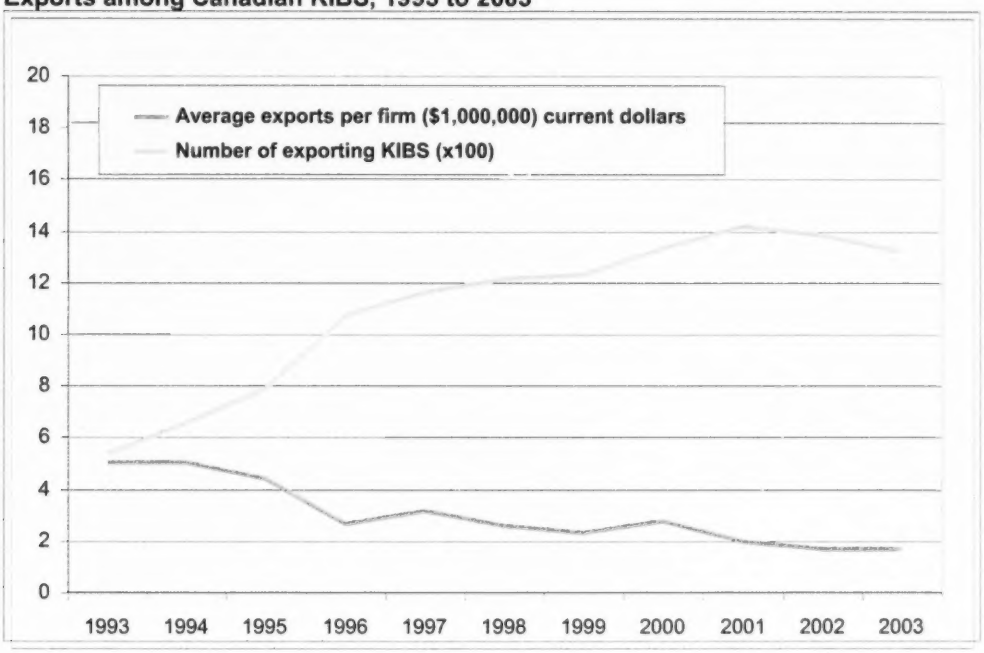
## KIBS and Canada's exports of services

From 1993 to 2004, Canada's overall exportation of services has almost doubled, growing from 32.6 to 59.6 billion dollars (chained 1997). The proportion of service exports out of total exports has remained very steady since 1993 however, at just under 13% (Statistics Canada CANSIM II, 380-0027).

From 1993 to 2003, the number of KIBS firms exporting annually more than doubled, going from just over 500 to almost 1400[1]. During this time however, the value of exports of KIBS in current dollars spiked at times, but was almost unchanged from 1991 to 2003, at just over 2.2 billion. In constant 2003 dollars, this represents a net diminution of export values of KIBS, from approximately 2.7 billion in 1991 dollars to 2.2 billion in 2003.

During this time therefore, the average value of exports per establishment fell (see Chart A) among KIBS. With this, the variability of export values also fell, as the values of exports per establishment converged somewhat, as seen in Chart A

**Chart A**
**Exports among Canadian KIBS, 1993 to 2003**




Source: Statistics Canada, Exporter Register.

A pronounced shift is also seen in the industry types of exporting KIBS. Whereas in 1991, just over 80% of all the export value of KIBS came from just one type of industry (R&D in Physical, Engineering and Life Sciences), a gradual and steady decline of this industry's export dominance took place by 2003, when these establishments represented only 41% of all KIBS exports and other categories of KIBS establishment all increased their share of total exports.

In spite of this, a large gap still exists in our knowledge of service-industry exporters. Particularly in what concerns their knowledge intensity, innovativeness, size and other mediating factors which make a KIBS commercial service provider an exporter, much work remains to be done in identifying the establishment-level features associated with both innovation and exporting.

1. Source: Statistics Canada, Exporter Register.

## Innovativeness, establishment characteristics and exporting

There is evidence to suggest that innovative establishments may display features that are markedly different from the rest. Previous research on service sector industries based on Statistics Canada's Survey of Innovation (1996 and 2003) has shown that innovative establishments tend to display characteristics that are different from characteristics of non-innovative establishments. Particularly, innovative service sector establishments tend to employ a higher proportion of highly skilled personnel (Earl, 2005), and the ones that do tend to give a higher rating to the importance of knowledge management practices. For this reason, the present study will investigate the degree to which establishments' knowledge intensity characteristics are associated with innovation and the tendency to export.

However, innovators and non-innovators tend to differ along a much wider series of characteristics, as innovators within business services are more likely to employ a wide series of practices or strategies and place more emphasis on foreign expansion (Gellatly, 1999).

For manufacturers, establishment size has also been positively linked to exporting, since larger establishments have more resources available to overcome fixed or sunk costs of becoming an exporter (Lefebvre and Lefebvre, 2001; Aitken et al, 1997; Bernard and Jensen, 1999). Establishment size effects have been strongly confirmed in several manufacturing sector studies on exporting (Gourlay and Seaton, 2004). However, it is unclear how establishment size effects may be different for service-sector establishments as compared to manufacturing establishments, since the fundamental nature of their product (which is a service) may imply different cost considerations associated with exporting.

A "stages" approach has also been proposed to understanding the process of internationalisation of establishments, and has been applied specifically to KIBS (Roberts, 2000). This would imply adopting a longitudinal understanding of how KIBS gradually acquire key competencies necessary to later expand and succeed in foreign markets. This approach would involve an understanding of the product cycle, involving the R&D or other innovative activity required to develop a new or significantly improved product and subsequent steps to commercialize it, as well as how an establishment may differ according to their "stage" in this process. However, the cross-sectional nature of the database available for this study makes a stages approach mostly unverifiable in understanding innovativeness and its link to exporting.

## Methodology

Statistics Canada's 2003 Survey of Innovation sampled 913 establishments from 9 selected professional scientific and technical services industries. They are all service sector establishments that provide commercial services to other establishments and not to end-users directly. These industries also qualify as KIBS because of the high knowledge-intensity indicators of the establishments found within them: a high percentage of university graduates among their staff and a high percentage of establishments performing R&D internally.

A majority of staff in these establishments tended to be university diploma holders, from 35% (Industrial design services establishments) to 91.3% (Establishments in environmental consulting services) of all firms having mostly university graduates in their staff. A majority of establishments in all of these industries tended to allocate some staff to R&D activities, except for firms in Management Consulting, of which only 36.1% allocated some staff to these activities (Statistics Canada, Survey of Innovation, 2003).

**Table A**
**Population, sample and response rate for selected professional, scientific and technical service industries**

| Industry description with North American Industry Classification System (NAICS) code | Population | Sample size | Response rate |
|---|---|---|---|
| | | | % |
| Engineering services (541330) | 1,356 | 348 | 74.2 |
| Geophysical Surveying and Mapping (541360) | 115 | 56 | 84.8 |
| Industrial Design Services (541420) | 51 | 38 | 90.9 |
| Computer System Design (541510) | 2,178 | 338 | 65.8 |
| Management Consulting Services (541611) | 1,568 | 266 | 76.1 |
| Environmental Consultants (541620) | 120 | 87 | 73.8 |
| Other Scientific and Technical Consulting Services (541690) | 245 | 129 | 87.4 |
| R&D in Physical, Engineering and Life Sciences (541710) | 480 | 174 | 74.6 |
| R&D in the Social Sciences and Humanities (541720) | 104 | 76 | 71.2 |

Source: Statistics Canada, Survey of Innovation 2003.

The 913 establishments from the 9 selected industries represent 4886 KIBS establishments within Canada.

The establishments were classified as non-exporters, partial exporters and mostly exporters according to the estimated proportion of total revenues coming from sale of products outside of Canada. The answers were then used to create a three-level ordered categorical variable.

The establishments were classified as either innovators or non-innovators, according to whether they reported having introduced a significantly improved product or process on the market within the last 3 years (2001 to 2003). Further distinctions were made between product and process innovators, but these were only used in the regression part of the analysis, because of insufficient significant results in the descriptive tables.

## Descriptive results

### Innovative establishments are more likely to be exporters

In Table B, it is evident that non-innovative establishments within the selected KIBS industries are less likely to be exporters. An estimated 66.5% of non-innovators within these industries derive all of their revenues from within-Canada sales only, while this is the case for only 35.1% of innovative establishments. Only an estimated 14.6% of non-innovative establishments are mostly exporters.

**Table B**
**Tendency to export among innovative and non-innovative establishments**

| | Proportion of establishments grouped by innovator type (With 95% confidence interval +/-) | | |
|---|---|---|---|
| | Non-innovative | Innovative | Both innovators and non-innovators |
| | % | | |
| Non-exporters | 66.5 (3.3) | 35.1 (2.7) | 45.9 (2.1) |
| Partial exporters | 18.9 (2.7) | 38.1 (3) | 31.5 (2.2) |
| Mostly exporters | 14.6 (2.7) | 26.8 (2.8) | 22.6 (2) |
| **Total** | **100** | **100** | **100** |

Source: Statistics Canada, Survey of Innovation 2003.

Innovative establishments are therefore more likely than non-innovative establishments to be partial exporters, as well as predominant exporters, and are less likely to be non-exporters.

## Does knowledge intensity matter?

Although the selected KIBS industries were chosen because of the high knowledge component (in terms of R&D performance and highly educated workforce), establishments within these industries may be different in respect to measures of knowledge-intensity. In other words, there may be more and less knowledge-intensive establishments within a knowledge-intensive field and this may be correlated with the tendency of innovating and exporting. This is reflected in past literature within new technology establishments that suggests that competencies are more establishment-specific and not industry-specific (Baldwin and Gellatly, 1998).

From Table C, it appears that knowledge intensity (measured by the proxy of percentage of an establishment's employees having a university degree) is indeed positively correlated with both innovating and exporting.

Among innovators, the difference between non-exporters and mostly exporters is significant, the former having an average of 55% diploma holders compared to 69% in the latter. The difference between partial exporters and mostly exporters is also significant, the former having an average of 59% degree holders as proportion of total staff.

**Table C**
**Percentage of establishment's employees having a university degree**

| | Average proportion of employees with degree with 95% confidence interval (% +/-) | | |
|---|---|---|---|
| | Non-innovators | Innovators | Total |
| | % | | |
| Non-exporters | 41.9 (7.3) | 54.6 (5.5) | 48.2 (4.5) |
| Exporter, but mostly domestic | 57.6 (9.1) | 59.3 (5.3) | 59.0 (4.6) |
| Mostly export sales | 59.0 (8.0) | 69.2 (4.1) | 66.9 (3.7) |
| **Total** | **47.4 (5.3)** | **60.3 (3.0)** | **55.8 (2.7)** |

Source: Statistics Canada, Survey of Innovation 2003.

Among non-innovators, the same relationship is observed, with non-exporting non-innovators having the lowest proportion of degree holders, a significantly lower percentage than non-innovators that are mostly exporters.

# Regression analysis

## Logit regression models

A series of multinomial Logit regressions were performed in order to identify the impact of innovativeness on the dependent variable of export orientation, while controlling for a series of other possible factors that may also vary with exporting.

These factors are industry group effects (according to the NAICS code), being a part of a larger establishment, being Canadian or foreign-controlled, knowledge intensity (measured by proportion of employees with a university diploma), importance for revenues of intellectually protected products (% of revenue derived from these products) having a very specific product (niche market) and lastly, establishment size as measured by total employment.

The variables **Percentage of employees with diploma** and **Percentage of intellectual property protected** are the only two continuous variables in the regressions. These are based on questions on the 2003 Survey of Innovation that asked the respondent to estimate the Percentage of full-time employees in 2003 who were university graduates and the Percentage of products (goods or services) protected by patents, trademarks or copyrights (in terms of their contribution to total revenues) in 2003.

Bootstrap weights were derived in order to provide the most accurate standard error measures.

Regressions were carried out in several stages as follows:

## Regression 1
## Multinomial Logit regression – all KIBS

A multinomial Logit regression was performed, identifying the dependent variable, export orientation, in three levels:

0 – No revenue from exports.
1 – A minority of revenue from exports.
2 – A majority of revenue from exports.

Most of the dependent variables were binary dummies, indicating: innovativeness, offering a "niche" product, being Canadian-controlled and being a branch or subsidiary of a larger establishment. Continuous variables for knowledge intensity of the establishment (as measured by proportion of university graduates out of total staff) as well as use of knowledge-protection (proportion of revenues coming from intellectual property protected products or services) were used. Establishment size variables (3 dummies) and industry code variables (9 dummies) were also included in the initial model.

Establishment size (according to total employees) was used to investigate the effect of establishment size on export orientation. Various ways of introducing the variable in the Logit model were tried. A log of total employees was tried in order to normalize the effect of employment on export orientation. However, since a non-linear (U-shaped) relationship between size and export tendency was observed during exploratory analysis, with establishments with 20 employees or less and establishments upwards of 60 employees being more likely to export than middle-sized establishments, 3 size categories were introduced into the regression:

1. Small size - 20 employees or less
2. Medium size - 21 to 60 employees
3. Large size - 61 employees and more

These 3 categories, besides denoting size groups with similar probabilities of exporting, also distributed the sample almost evenly into three size classes.

## Regression 2
## Multinomial Logit regression - only new technology KIBS

The same explanatory variables as above were introduced, but a variation of the innovativeness independent variable was used: separate dummy variables for process innovators and product innovators or product + process innovators. This is because process only innovators were found to have a lower probability of exporting than even non-innovators.

This second regression also only included only the new technology KIBS, using 7 out of the 9 industry groups included previously. This is because strong industry effects were noted in the first regression, with new technology KIBS being much more likely to export than the other types of KIBS (Management Services and R&D in the Social Sciences and Humanities).

## Regression 3
## Multinomial Logit - separate regressions for establishments of different sizes

The same multinomial Logit regression was then performed separately for different establishments in the sample, to determine if their tendency to export is impacted differently by the series of explanatory variables. The same explanatory variables were used as in the previous models, except excluding industry class and Canadian or foreign control dummy, due to insufficient sample size for foreign controlled KIBS establishments.

## Regression 4
## Multinomial Logit - separate regressions for product innovators and non-innovators

In order to advance in explaining the phenomenon of non-innovators exporting and innovators not exporting, separate regressions were run for non-innovators and for product innovators, with process innovators excluded due to insufficient sample size. This regression also investigates if the factors that explain export tendency are different among these two groups.

## Results of regression analysis

From the results of the first regression, presented in Table D.1, it is seen that being an innovator on the innovator/non-innovator dummy increases the probability of a company being partially or primarily an exporter, even when accounting for company size, industry type, importance of intellectual property protection, country of control, being a branch of a larger company, being in a niche market or the proportion of diploma holders in staff.

**Table D.1**
**Multinomial Logit regression**

| All KIBS industries, innovator and non-innovator dummy | | |
|---|---|---|
| **Reference dependent variable value: Non-exporter** | **Primarily exporter** | **Exporter, but primarily domestic** |
| | **Coefficient estimate** | |
| **Intercept** | -3.12*** | -3.73*** |
| Branch | -0.94** | -0.20 |
| Niche market | 0.30 | 0.06 |
| Canadian controlled | -0.73 | 0.70 |
| Innovator | 0.60* | 0.94*** |
| Percentage of employees with diploma | 0.02*** | 0.01** |
| Percentage of intellectual property protected | 0.01*** | 0.00 |
| Small company size (15 to 20 employees) | 0.47 | 0.79*** |
| Large company size (over 60 employees) | 1.16*** | 1.01*** |
| Computer | 1.75*** | 1.63*** |
| Industrial | 2.19*** | 0.79 |
| Geophysical | 0.46 | 0.90 |
| Engineering | 1.00* | 1.38*** |
| Environmental | 0.24 | 1.70*** |
| Scientific | 1.60*** | 0.70 |
| Physical | 1.22** | 0.19 |
| R&D in Social Sciences and Humanities | 0.62 | -0.70 |

Population = 913
*= significant at the 90% confidence level
** = significant at the 95% confidence level
*** = significant at the 99% confidence level

Note: Excluded dummy variables: Not a branch, Niche products unimportant, Foreign-controlled, Non-innovator, Medium company size, Management consulting.

It is also seen that firms in certain KIBS industries have significantly higher probabilities of exporting. Smaller and larger company sizes are significantly more likely to export than medium-sized companies, although the higher probability of small-sized companies of being primarily export-oriented is not statistically significant.

Being a branch or subsidiary of another establishment significantly decreases the probability of being primarily an exporter. The importance of intellectual property protection as well as the training level of the workforce (% of employees with diploma) also had positive effects on exporting. As these are continuous variables, the apparently small estimated effect of each extra percentage point is still highly significant.

In Table D.2, a slight alteration on the first Logit regression is presented, the only differences being the exclusion of non-technology KIBS, namely Management Consulting and R&D in the Social Sciences and Humanities, as well as separating process-only innovators from establishments that carry out product as well as product and process innovations. This is because process-only innovators were found to have a lower probability of exporting than even non-innovators. In this regression however, this is not a statistically significant result.

Interestingly, when non-technology KIBS industries are excluded, the significance of all industry effects disappears, while the significance and direction of all other variables' effects remains. Since it would appear that new technology KIBS are more export-oriented than other KIBS, the remaining regressions will exclude the latter.

**Table D.2**
**Multinomial Logit regression**

**Only new technology KIBS industries, separate product and process dummies**

| **Reference dependent variable value : Non-exporter** | **Primarily exporter** | **Exporter, but primarily domestic** |
|---|---|---|
| | **Coefficient estimate** | |
| **Intercept** | -3.081*** | -2.670*** |
| Product or product and process innovator | 1.212** | 1.207*** |
| Process only innovator | -0.173 | -0.365 |
| Branch | -1.015** | -0.299 |
| Niche market | 0.424 | 0.033 |
| Canadian controlled | -0.609 | 0.822 |
| Percentage of employees with diploma | 0.025*** | 0.013*** |
| Percentage of intellectual property protected | 0.010*** | 0.000 |
| Small company size (15 to 20 employees) | 0.297 | 1.048*** |
| Large company size (over 60 employees) | 1.149** | 1.041** |
| Computer | 0.821 | 0.308 |
| Industrial | 1.517 | -0.563 |
| Engineering | 0.333 | 0.123 |
| Environmental | -0.621 | 0.353 |
| Scientific | 0.843 | -0.607 |
| Physical | 0.492 | -0.980 |

Population = 913
*= significant at the 90% confidence level
**= significant at the 95% confidence level
***= significant at the 99% confidence level

Note: Excluded dummy variables: Not a branch, Niche products unimportant, Foreign-controlled, Non-innovator, Medium company size, Geophysical.

The previous regressions have raised interesting issues around establishment size and export tendency, in the context of innovativeness and other explanatory variables. Particularly, contrary to previous research, small-sized establishment were significantly more likely to be exporters than medium-sized establishments. In order to investigate if the explanatory variables behind new technology KIBS' tendency to export vary by establishment size, 3 separate regressions were carried out for establishments of different sizes.

| Table D.3<br>Multinomial Logit regression<br>Only new technology KIBS industries, separate product and process dummies, separate regressions for different company sizes | | | | | | |
|---|---|---|---|---|---|---|
| | Population = 148<br>Small<br>(15 to 20 employees) | | Population = 272<br>Medium<br>(21 to 60 employees) | | Population = 358<br>Large<br>(More than 60 employees) | |
| Reference dependent variable value : Non-exporter | Primarily exporter | Exporter, but primarily domestic | Primarily exporter | Exporter, but primarily domestic | Primarily exporter | Exporter, but primarily domestic |
| | Coefficient estimate | | | | | |
| **Intercept** | -3.267 | -1.496* | -3.506*** | -1.718*** | -3.002*** | -1.347 |
| Product or product and process innovator | 1.076 | 0.200 | 0.968* | 1.613*** | 2.726*** | 2.003** |
| Process only innovator | 2.608 | -0.283 | -2.573*** | -0.852 | 1.873 | 0.870 |
| Branch | -0.940 | -0.318 | -0.863 | -1.045** | -1.762* | -0.079 |
| Niche market | 1.230 | 1.704*** | 0.954 | 0.204 | -1.065 | -1.102 |
| Percentage of employees with diploma | 0.012 | 0.008 | 0.035*** | 0.011 | 0.042** | 0.027* |
| Percentage intellectual property protected | 0.033*** | 0.017* | -0.003 | -0.002 | 0.010 | -0.013 |

*= significant at the 90% confidence level
**= significant at the 95% confidence level
***= significant at the 99% confidence level

Note: Excluded dummy variables: Not a branch, Niche products unimportant, non-innovator.

Interestingly, there is evidence that the explanatory factors behind export tendency vary according to the company size of KIBS establishments. For small sized KIBS, which were found previously to be more export-oriented than medium-sized ones, being an innovator cannot be shown in this study to have a significant effect on export tendency (although it may), as is the case with medium and large-sized establishments. Instead, being in a niche market and the importance of intellectual property protection are the variables showing significant effects on export orientation. For medium and large sized establishments, these latter variables did not have significant effects, export orientation being correlated with product innovation and the percentage of diploma holders among staff.

Lastly, since there are non-innovators that export and innovators that do not, there is the question of whether the explanatory factors behind these establishments' export tendency differ. For this reason, two separate regressions were run for product innovators as well as for non-innovators. Due to small sample size, running this regression for process-only innovators did not produce any significant results.

| Table D.4<br>Multinomial Logit regression<br>Only new technology KIBS industries, separate product and process dummies, separate regressions for product innovators and non-innovators | | | | |
|---|---|---|---|---|
| | Non-innovator (Population= 357) | | Product innovator (Population=244) | |
| | Primarily exporter | Exporter, but primarily domestic | Primarily exporter | Exporter, but primarily domestic |
| Reference dependent variable value: Non-exporter | Coefficient estimate | | | |
| Intercept | -2.419*** | -2.377*** | -2.317*** | -0.048 |
| Branch | -0.621 | -0.342 | -1.257** | -0.723* |
| Niche market | 0.804 | 0.733 | -0.079 | -0.390 |
| Percentage of employees with diploma | 0.015* | 0.012* | 0.038*** | 0.014** |
| Percentage of intellectual property protected | 0.080 | 0.000 | 0.017** | 0.005 |
| Small company size | -0.491 | 1.331*** | 0.118 | 0.107 |
| Large company size | 0.011 | 0.891 | 1.249** | 0.895 |

*= significant at the 90% confidence level
** = significant at the 95% confidence level
*** = significant at the 99% confidence level

Note: Excluded dummy variables: Not a branch, Niche products unimportant, medium company size.

Among the interesting results of this last regression, it is found that the small company size dummy is very significantly associated with a non-innovative establishment being an exporter but primarily domestic-oriented in their sales (See Table D.4). The large company size dummy is seen to be significantly associated with a product innovator establishment being primarily an exporter. These results complement the results of the last set of regressions, presented in table D.3. They suggest that there are many types of exporting KIBS, some large and some small and that the factors that explain their export orientation are different.

## Conclusions

Innovativeness, and in particular being a product innovator, is positively associated with KIBS' export orientation, even when accounting for the effects of country of control, establishment size, industry, knowledge-intensity and use of intellectual property protection. In all cases, being a branch or subsidiary of a larger establishment decreased an establishment's probability of being an exporter.

For the most part, the positive correlation of establishment size to export tendency (observed in manufacturing-sector studies) was found to hold true, with a slight alteration. Very small-sized establishments are likely to be more export-oriented than medium-sized ones, while large establishments beyond a certain size threshold (established at approximately 60 to 70 employees) are the most likely to export. The ability of small-sized establishments to export is explained mostly by the importance of very specific (niche) products and the use of intellectual property protection, and suggests that among KIBS, the barriers of entry into export markets faced by small establishments are not as prohibitive as in the manufacturing sector.

Innovativeness was also not significant in explaining export tendency in the case of small-sized KIBS, but was very significant in explaining large-sized establishments' tendency to export. It would appear that large company size, coupled with being a product innovator, are important explanatory variables for a firm being mostly export-oriented, while small company size, even in the absence of innovation is an important factor in explaining being an exporter, but mainly domestically-oriented. This suggests that the universe of KIBS is quite diverse, and one can speak of at least two categories of export-oriented KIBS: small, niche-oriented ones that seek export links as a secondary activity and large, innovative KIBS that actively pursue export markets.

For establishments of all sizes, innovative profile and industry class, having a high proportion of highly skilled staff (a proxy for knowledge intensity) also had a positive and significant effect on the probability of exporting.

It was seen that KIBS elsewhere defined as new-technology KIBS, such as those in Scientific and Technical Consulting, Computer Consulting, Engineering and Environmental Consulting tend to be more export-intensive than others, such as Management Consulting Services and R&D in the Social Sciences and Humanities.

While a nuanced link between innovativeness together with other establishment characteristics is supported by this study, future research could perhaps explore the longitudinal nature of the internationalisation of Canadian KIBS, as well as the role of company size and intellectual property protection in this process.

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**88-001-X Volume 30 – 2006**

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**88-001-X Volume 29 – 2005**

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